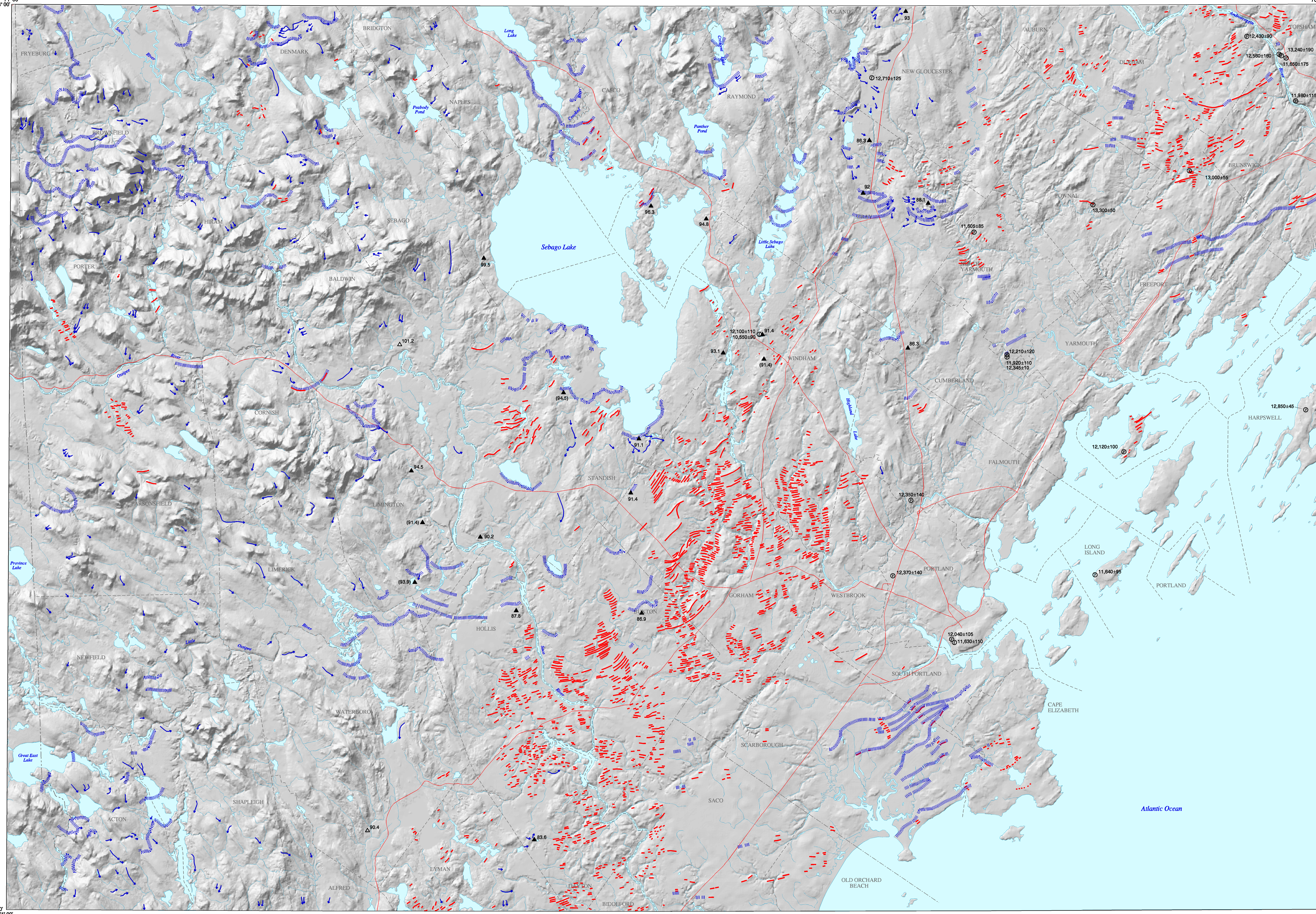
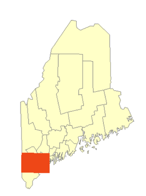
Deglaciation Features in the Portland 1:100,000 Quadrangle, Maine



Shaded relief base by Marc C. Loiselle using a digital elevation model with a 10-meter grid, sun angle of 315°, and sun elevation of 45°.

Miles (mi) 0 1 2 3 4 5 6 7 8 9 10 11 12

Map Scale
1:100,000



Quadrangle Location

Kilometers (km) 0 2 4 6 8 10 12 14 16 18 20

National geodetic vertical datum of 1929.

Portland Quadrangle, Maine

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This map shows information concerning the recession of the most recent glacial ice sheet from the Portland 1:100,000 quadrangle in southern Maine. The Laurentide Ice Sheet originated in Canada and advanced generally southward across New England, reaching its maximum extent on the continental shelf about 28,000 to 24,000 years ago (Stone and Borns, 1986; Ridge, 2004). Subsequent deglaciation occurred through a combination of thinning of the ice and recession of the glacier margin as the climate warmed and the ice sheet melted. Marine submergence accompanied ice retreat in lowland areas of southern Maine, including the region south and east of Sebago Lake on this map.

Several types of field evidence indicate the direction and pattern of ice retreat across the map area. This evidence occurs selectively in valleys and the area of marine submergence, where glacial processes (often involving erosion and sedimentation by meltwater streams) left a record of where the ice margin stood at various times. Moraine ridges provide the clearest indication, since most of them were deposited right along the edge of the glacier. Meltwater channels, and ice-contact slopes or kettle zones at the heads of water-laid sand and gravel deposits, likewise mark ice-margin positions in certain areas. Correlations of these indicators between valleys or across long distances are usually very uncertain and have not been attempted here.

Ages obtained from radiocarbon dating of fossil organic remains are shown on the map. They provide minimum limits on the timing of glacial retreat. These are the original ages in radiocarbon years, as reported by the dating laboratories. They are younger than actual calendar ages by about 2,000 to 2,500 years. Lab ages have not been calibrated to calendar equivalents because of uncertainty regarding the magnitude of the correction factor that should be subtracted from ages of marine fossils to compensate for old carbon in sea water. The deglaciation chronology of Maine needs refinement, but a summary and interpretation of available data is provided by Borns and others (2004).

Figure 1. Aerial view of bouldery moraine ridges crossing a blueberry field in Sedgwick. Moraines such as these are widespread across southern Maine, but many of them are not so easily seen. The ice margin retreated from right to left (northward) in the area shown here. The close spacing of these moraines suggests they may be annual features, with the space between them indicating how far the ice margin receded during the summer melt season.

Figure 2. Bouldery moraine ridge in Cherryfield. This moraine was deposited in the sea at the edge of the last glacial ice sheet during its retreat from southern Maine. The blueberry field (foreground) is probably underlain by sandy marine sediments.

Figure 3. Deep pit exposure in glacial-marine delta at East Gray. This is one of many ice-contact deltas built along the glacier margin where it stood in the sea. The delta has two parts. The nearly horizontal gravel layer on top is the "topset" unit. It was laid down by glacial meltwater streams washing across the delta top. The underlying "foreset beds" are inclined in a seaward direction. They consist of sand and gravel that cascaded down the front of the expanding delta and eventually was covered by the topsets. The boundary between the two units marks the position of sea level when the delta was built.

REFERENCES

Borns, H. W., Jr., Doner, L. A., Dorion, C. C., Jacobson, G. L., Jr., Kaplan, M. R., Kreutz, K. J., Lowell, T. V., Thompson, W. B., and Weddle, T. K., 2004, The deglaciation of Maine, U.S.A., *in* Ehlers, J., and Gibbard, P. L. (editors), *Quaternary Glaciations-Extent and Chronology, Part II: North America*: Elsevier, Amsterdam, p. 89-109.

Ridge, J. C., 2004, The Quaternary glaciation of western New England with correlations to surrounding areas, *in* Ehlers, J., and Gibbard, P. L. (editors), *Quaternary Glaciations-Extent and Chronology, Part II: North America*: Elsevier, Amsterdam, p. 169-199.

Stone, B. D., and Borns, H. W., Jr., 1986, Pleistocene glacial and interglacial stratigraphy of New England, Long Island, and adjacent Georges Bank and Gulf of Maine: *Quaternary Science Reviews*, v. 5, p. 39-52.

RELATED MAPS

Tolman, S. S. (compiler), 2006, Glacial ice-flow indicators in the Portland 1:100,000 quadrangle, Maine: Maine Geological Survey, Open-File Map 06-4.

Tolman, S. S. (compiler), 2006, Surficial geology of the Portland 1:100,000 quadrangle, Maine: Maine Geological Survey, Open-File Map 06-1.

EXPLANATION OF SYMBOLS

End moraine. Ridge of till and/or water-laid sediments deposited at the margin of the late Wisconsinan ice sheet. The actual numbers of moraines have been reduced in areas where they are very closely spaced.

Ice margin position. Hachured line shows position of the receding late Wisconsinan glacier margin. Most of these positions were inferred from ice-contact topography, including the heads of deltas, subaqueous fans, and other water-laid glacial deposits, as well as meltwater channels in areas above the marine limit.

Meltwater channel. Arrow indicates channel eroded by glacial meltwater, either as a stream originating at the ice margin or by drainage from the outlet of a glacial lake.

▲350 **Glaciomarine delta.** Solid triangle marks site where the contact between topset and foreset beds in a glaciomarine delta has been observed. Number is elevation of the contact, in meters, which indicates local relative sea level when the delta was deposited. Elevations in parentheses were measured by altimeter or estimated from topographic map contours. All other elevations were determined by precise surveys.

△350 **Glaciolacustrine delta.** Open triangle marks site where the contact between topset and foreset beds in a glaciolacustrine delta has been surveyed. Number is elevation of the contact, in meters, which indicates the lake level when the delta was deposited.

10,150±450 Ⓕ
10,150±450 ⓕ
Dated fossil locality. Site where one or more radiocarbon ages have been obtained from fossil organic material. **(F)** = marine fossil locality, with uncorrected radiocarbon age. **(f)** = terrestrial fossil locality. A correction of at least -600 years to laboratory ages of marine shells is probably needed to equate them with terrestrial ages. All of the marine ages shown on the map were obtained from shells, with the exception of the site in Portland, where spruce logs were found buried in glaciomarine clay.

Road

Town boundary

County boundary

State boundary

PORTLAND Township name

INDEX TO SOURCES OF GEOLOGIC MAP DATA

1:24,000 Surficial geologic quadrangle maps, authors, and Maine Geological Survey Open-File numbers. In some areas the original map data have been supplemented with more recent observations.

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